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RESEARCH NOTE NC-49

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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Regeneration of Cutover Jack Pine Stands

ABSTRACT.—Jack pine can be regenerated on mineral soil seedbeds by scattering cone-bearing branches or repellent-treated seed. On some areas where competition develops, the seedlings may need to be released between the third and fifth years.

Past experiments to develop low cost techniques for regenerating jack pine have shown promising results when seeds or cone-bearing branches were scattered on mineral soil seedbeds (Eyre 1936, LeBarron and Eyre 1938, LeBarron 1944). One large-scale trial on the Chippewa National Forest was also successful (Zehngraff 1943).

The two tests reported here provide additional examples of satisfactory regeneration of jack pine obtained by these techniques. And since these studies were installed, the Superior National Forest has used the methods with good success on a number of areas. Similarly, in Manitoba, Canada, Cayford (1966) reports successful cone scattering and seeding trials on seedbeds prepared with mechanical equipment.

Planting usually gives more satisfactory results than scattering cones or seed, largely because planted seedlings have a head start on the other vegetation and their roots have a larger soil volume from which to draw moisture during the first few years. But planting is costly and this high investment may not be justified except on the better sites—sites that usually should be planted to a more valuable species such as red pine. Therefore, on sites where it is desirable to regenerate jack pine following the harvest of a mature stand, the techniques described in this Note are recommended.

Study Methods

In 1957 a pilot-scale regeneration study of scattering cone-bearing branches on mineral soil seedbeds was established in northeastern Minnesota. The study was replicated in three jack pine stands between the ages of 80 and 90 years. Stand densities ranged between 89 and 120 square feet of basal area per acre, and all three stands had light to medium shrub cover in the understory (fig. 1). The organic layer above the mineral soil averaged between 1.8 and 2.6 inches.

A heavy-duty disk was used to prepare seedbeds by exposing mineral soil on some plots prior to logging and on others following logging (fig. 2). Disking after logging exposed mineral soil on 48 percent of the area compared to 38 percent where the disking was done before logging. Plots that were logged but were not disked had mineral soil seedbeds on only 9 percent of the area.

Cone-bearing slash was scattered on the disked seedbeds. When this was done concurrently with disking, it required only 3.6 man-hours per acre; but when it was done as a separate task as was necessary on the areas disked before logging, it required 12.6 man-hours per acre. Most of this extra time was

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Figure 1.—Study areas in Minnesota prior to logging had 80- to 90-year-old stands of jack pine with a shrub understory of light to medium density.

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Figure 2.—Mineral soil seedbeds in the Minnesota study were prepared with this heavy-duty disk.

used to locate cone-bearing slash or mineral soil seedbeds. Cones distributed by logging only were found on 71 percent of the milacres, and scattering the cone - bearing branches increased this to over 90 percent.

In 1960 another version of this technique was tested in three areas in the Upper Peninsula of Michigan. Mineral soil seedbeds were prepared by scalping, and jack pine seed was scattered on the scalped seed spots. The areas had been clear cut earlier, removing pole-sized jack pine stands that were classed as medium stocking. The shrub cover was a very light stand of scattered blueberry; and the slash was 3 months, 1 year, and 3 years old on these areas at the time of site preparation.

The scalping was done with an "Imset scarifier" manufactured in Sweden. This machine prepared an average of 468 scalps per acre, each approximately 2 feet wide, 2 to 6 feet long, and 6 inches deep. The variation in length of scalps was caused by stumps or slash that tripped the scarifier blades before the preset 6-foot interval was reached. However, the average size of scalps was about the same on the three areas, indicating that the age of the slash was not important in the operation.

Jack pine seed was sown on each area at the rate of 8 to 10 seeds per scalp. The seed was treated with chemical repellents, arasan and endrin, to protect it from seed-eating birds, rodents, and insects.

Results

Regeneration surveys at the end of 1, 3, and 5 years showed the importance of seedbed preparation (table 1). Areas that were logged without any additional seedbed treatment were far below all other treatments in percent stocking. After 3 years the areas that were disked or scalped after logging were adequately stocked, and the areas disked before logging averaged only slightly below the arbitrarily established minimum of 60 percent stocking.

However, during the next 2 years the stocking declined on the disked areas of the Minnesota study. The light to medium shrub cover and some aspen reproduction were beginning to compete with the jack pine seedlings. In the Michigan areas, which had only a light to sparse shrub cover and also had scalped seedbeds, stocking continued to increase through the fifth year.

Table 1.—*Percent stocking*[1] *by kind of treatment*

Treatment	Years after treatment		
	1	3	5
Log only	6	9	11
Log, disk, scatter cones	53	60	45
Disk, log, scatter cones	53	56	42
Log, scalp, spot seed	51	66	74

1/ Based on milacre plots except for scalp treatment which is based on number of scalps.

Discussion

These studies illustrate several important requirements for regenerating jack pine: exposing a mineral soil seedbed, distributing cones or treated seed on the prepared seedbeds, and releasing the seedlings from other vegetation. Although each of these operations will not be equally important on all areas none of them should be overlooked.

Mineral soil seedbeds have been prepared with many kinds of mechanical equipment and undoubtedly many new kinds will be developed. At present, some of the more common equipment includes the shearing blade, rock rake, and Rapp cultivator. A heavy-duty disk, as was used in the Minnesota study, was perhaps the most popular a few years ago. The Imset scarifier used in the Michigan study was a forerunner of the Rapp cultivator. Whatever kind of equipment is used to prepare the seedbed, two major objectives should be: (1) to permit the tree seed to make contact with the mineral soil, where moisture conditions are considerably more stable than in the humus layers during the critical period of seed germination; and (2) to eliminate or sufficiently reduce the existing vegetation so that tree seedlings have

a better chance to compete for moisture, nutrients, and light.

Scattering cone-bearing branches or repellent-treated seed on the prepared seedbeds provides a better opportunity for seedlings to become established. Whenever cone-bearing slash is readily available, it can be scattered on the seedbeds by one man directly behind the scarifying equipment. On areas where cones are scarce or difficult to utilize, sowing repellent-treated seed is recommended.

Although these studies did not test the benefits of releasing the seedlings, they indicate that competition may be important in some cases. The difference in the development of competing vegetation between these two studies is similar to the results from another study where disking and scalping were tested:[1] After 3 years the oven-dry weight of competing vegetation averaged 43 percent greater on seedbeds prepared by disking than on those prepared by scalping. But even on the seedbeds prepared by scalping, the seedlings would undoubtedly have benefited from release as they had nearly three-fourths as much competition as those on unprepared areas. Therefore, the most efficient equipment available should be used to prepare a mineral soil seedbed, and the seedlings should be released when necessary, usually between the third and fifth years.

[1] *Study NC-192 in files of the North Central Forest Experiment Station, Grand Rapids, Minnesota.*

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